경제학석사 학위논문

The effect of Monetary Policy Shock on Real Farm & Metal Commodity Price

통화충격이 실질 농산, 광산 미가공품에
미치는 영향분석

2019 년 7 월

서울대학교 대학원

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신 종 훈

The effect of Monetary Policy Shock on Real Farm & Metal Commodity Price

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이 논문을 경제학석사 학위논문으로 제출함
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Abstract

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This paper examines the effect of monetary policy shocks on the real commodity farm and metal price using VAR models in the U.S. In order to analyze the ZLB(Zero Lower Bound) Period, this paper identifies monetary policy shocks by using Shadow Federal Funds Rate and Shadow Policy Rate. The main results are: 1) Contractionary monetary policy shocks significantly decrease real farm and metal price in the long run. 2) In a few historical episodes, real farm and metal prices are greatly influenced by monetary policy shocks. 3) Monetary policy shocks were more influential on former period than latter period. 4) Farm-sector price is more sensitive to monetary policy shocks.

Keywords : VAR, Farm Price, Metal Price, Monetary Policy Shock, Shadow Federal Funds Rate

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Chapter 1: Introduction

Besides the impact of monetary policy shocks on individual markets, whether or not monetary policy shocks affect the real price of farm and metal commodity is a highly controversial subject and many studies have been actively researched. If the monetary policy shock affects the real prices of farm and metal products, a corresponding policy on the farm and metal markets is needed.

According to past studies two major theories have been in the spotlight. First, the studies of Lapp(1990) and Belongia(1991) suggested a "misperception model" that the difference between the elasticity of money supply and the income elasticity of demand between farm and non-farm products creates price fluctuations. Second, Frankel(1986) and Stamoulis and Rausser(1988) argued "Overshooting model" in which volatile nominal prices fluctuate further under the influence of other sticky prices.

Appendix Figure 1,2,3 and 4 show the nominal and real farm and metal price with shadow federal funds rate. In each graph, the left scale represent farm and metal price index, and the right scale represent unit for federal funds rate. Nominal farm and metal price tend to increase over time. However, real farm and metal price tend to decrease over time. For some specific period, it is possible to observe where monetary tightening and real farm and metal price decrease. Appendix table 2 shows the correlation between shadow federal funds rate, nominal farm price, real farm price, nominal metal price and real metal price. The result shows that the correlation of shadow federal funds rate and nominal farm and metal price are negative, but the correlation of shadow federal funds rate and real farm and metal price are positive.

Han and Kim (2005) found that the VAR model using the Federal

Fund Rate(FFR) could act as a better identifier for monetary policy shocks than the model using the Monetary Aggregate Shock(M1 Shock). After analyzing, it found that 7 to 9 percent of the volatility was explained as a monetary policy shock. However, while the papers such as Isac and Rapach(1997) and Belongia(1991) argued that less than 10% of the figure was negligible, Han and Kim(2005) found that monetary policy shocks played a dominant role in certain sub periods through the historical decomposition.

Many of the preceding studies that have been presented so far exclude the sample after 2008. This is because FED keeps the Federal Funds Rate(FFR) at an unusually low level, thereby making the monetary policy of lowering the FFR no longer available. So, fed uses monetary policy using method such as quantitative easing. Thus continued consideration of how to measure the effectiveness of monetary policy made during this period. Then, Black(1995) made shadow rate term structure(SRTSM) for the first time. In the paper Wu and Xia(2015), by expanding the model of Black(1995), the author proposed a model that developed the previous model. This model can be used directly for discrete-time data and can show empirical example of recent changes in the Zero Lower bound period. The SRTSM of Wu and Xia(2015) was used to analyze changes in interest rates and monetary policy in such papers as Kim and Singletron(2012) and Bauer and Rudbusch(2013) and was useful in measuring the effectiveness of monetary policy. The author also argued that the Shadow Federal Fund Rate(SFFR) could be applied to empirical studies using VARs that have been researched so far. In addition to Shadow Federal Fund Rate, shadow Policy Rate from Lombardi and Zhu(2014) also acts as a good identifier of monetary policy in Zero Lower bound period.

In this paper, the monetary policy effects on farm and metal products are analyzed using Shadow Federal Fund Rate and Shadow

Policy Rate, which have not been analyzed with federal funds rates in the Zero Lower Bound(ZLB) period. The analysis verifies the theories of how monetary policy shocks affect the prices of real farm and real metal products. To do that, this paper uses models from Han and Kim's paper(2005).

Next, the relative price is calculated and compared to see the reactivity of the market between farm and non-farm products. The farm market can be more affected by monetary policy shocks because it can not control supply flexibly.

Chapter 2 : Methodology

2.1 VAR model

VAR (Vector Auto-Regression) models began to be used in the 1980s after the Friedman and Schwartz(1963) and Sims(1972). Sims (1980) highlighted the usefulness of the VAR model, a multivariate model with less arbitrary structural constraints. In addition, monetary policy impacts were analyzed with VAR model contains M1 and M2 which uses recursive structure using a Cholesky Decomposition. However, studies using M1 and M2 have faced Liquidity Puzzle. So, in subsequent papers such as Bernardke and Blinder(1992) and Sims(1992) the identifying method was developed using the impact of short-term interest rates as an indicator of monetary policy shocks. However, this created the Price Puzzle and resolved it to some extent by including the Community Price in Sims(1992).

The model that uses short-term interest rate as a identifier of unexpected changes in monetary policy is the model of Christiano, Eichenbaum, and Evans(1996, 1999). This can then be expressed as a

Structural VAR model below.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 & 0 \end{bmatrix} \begin{bmatrix} IP_t \\ CPI_t \\ PC_t \\ FFR_t \\ NBRD_t \\ TR_t \\ M_t \end{bmatrix} = G(L) \begin{bmatrix} IP_{t-1} \\ CPI_{t-1} \\ PC_{t-1} \\ FFR_{t-1} \\ NBRD_{t-1} \\ TR_{t-1} \\ M_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \\ \epsilon_{3,t} \\ \epsilon_{4,t} \\ \epsilon_{5,t} \\ \epsilon_{6,t} \\ \epsilon_{7,t} \end{bmatrix}$$

In this paper, we analyzed the variables we wanted to see by placing them in the X_t. The model assumes Fed sets the Federal Funds rate with current and lagged IP, CPI and PC, and lagged FFR, NBRD, TR, M1 and X.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 & 0 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 & 0 \\ a_{81} & a_{82} & a_{83} & a_{84} & a_{85} & a_{86} & a_{87} & 1 \end{bmatrix} \begin{bmatrix} IP_t \\ CPI_t \\ PC_t \\ FFR_t \\ NBRD_t \\ TR_t \\ M_t \\ X_t \end{bmatrix} = G(L) \begin{bmatrix} IP_{t-1} \\ CPI_{t-1} \\ PC_{t-1} \\ FFR_{t-1} \\ NBRD_{t-1} \\ TR_{t-1} \\ M_{t-1} \\ \end{bmatrix}$$

In addition, the model below was used except $NBRD_t$ because $NBRD_t$ was not measured from May 2013 and the model has not been available since then. In order to estimate until 2019 April, this paper used model without NBRD in addition to above model.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 1 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & 1 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} & 1 \end{bmatrix} \begin{bmatrix} IP_t \\ CPI_t \\ PC_t \\ FFR_t \\ TR_t \\ M_t \\ X_t \end{bmatrix} = G(L) \begin{bmatrix} IP_{t-1} \\ CPI_{t-1} \\ PC_{t-1} \\ FFR_{t-1} \\ TR_{t-1} \\ M_{t-1} \\ X_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \\ \epsilon_{3,t} \\ \epsilon_{4,t} \\ \epsilon_{5,t} \\ \epsilon_{6,t} \\ \epsilon \end{bmatrix}$$

2.2 Shadow Rates

Fed implemented a policy of keeping the Federal Funds Rate (FFR) at an unusually low level, thereby making the monetary policy of lowering the FFR no longer available. So, during this period, researcher continued to look at how to measure the effectiveness of monetary policy, and in Black (1995) the concept of Shadow rate term structure (SRTSM) was first presented. Several methods have since been presented in this paper, using Shadow Federal Funds Rate from Wu and Xia (2015) and Shadow Policy Rate from Lombardi and Zhu (2014).

Shadow Federal Funds Rate and Shadow Policy Rate's usefulness as a measure of monetary policy shocks have been confirmed by many studies such as Christensen and Rudebusch(2013), Bullard(2012) and Krippner(2012).

In this paper, we add Federal Funds Rate data and Shadow Rate data. Since, we can not use Federal Funds Rate data during 2008 to 2013 because in this period Federal Funds Rate stays same low level, we put shadow federal funds rate and shadow policy rate in that period.

Chapter 3: Results

3.1 Model with Shadow Federal Funds Rate and Non Borrowed Reserves

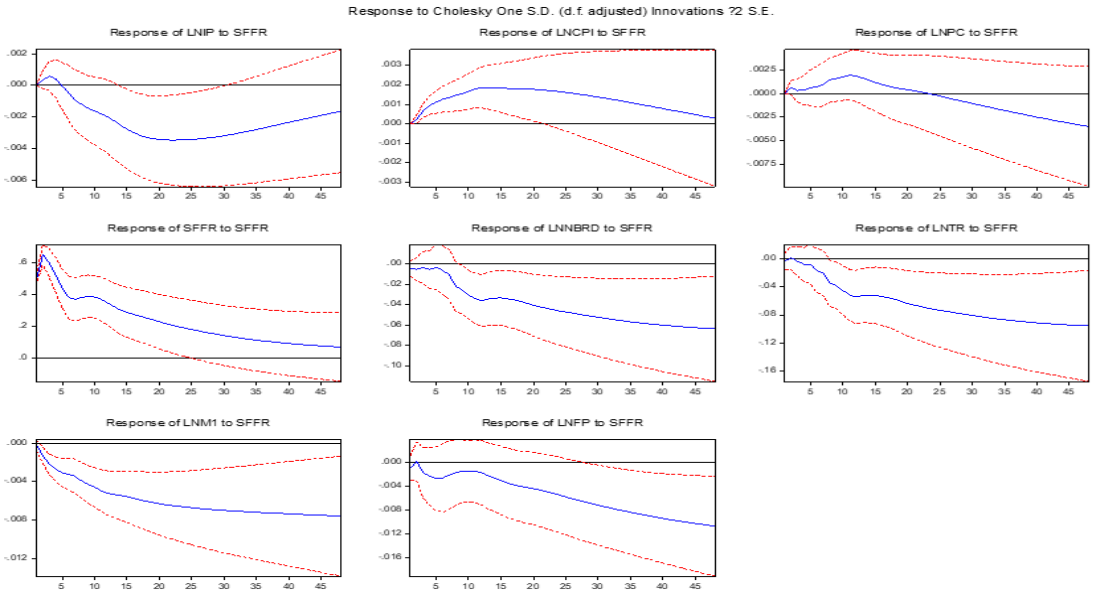

Figure 1 Nominal Farm Price Impulse Response Function with Shadow Federal Funds Rate 1969~2013

Figure 1 and 2, it shows the impulse response to contractionary monetary policy shocks over a 48-month period under "Farm Price" and "Real Farm Price." Dotted red lines are 95% probability bands. Each graph shows each variables' impulse response function, and the names of variables are noted at the top of each graph. Respectively, In response to contractionary monetary policy shocks, the nominal and real Farm Prices decrease persistently. It constantly decreases over time.

Figure 3 and 4, it shows the impulse response function under "Metal Price" and "Real Metal Price." Respectively, In response to contractionary monetary policy shocks, the nominal and real Metal Prices decrease persistently. However, impulse response of nominal

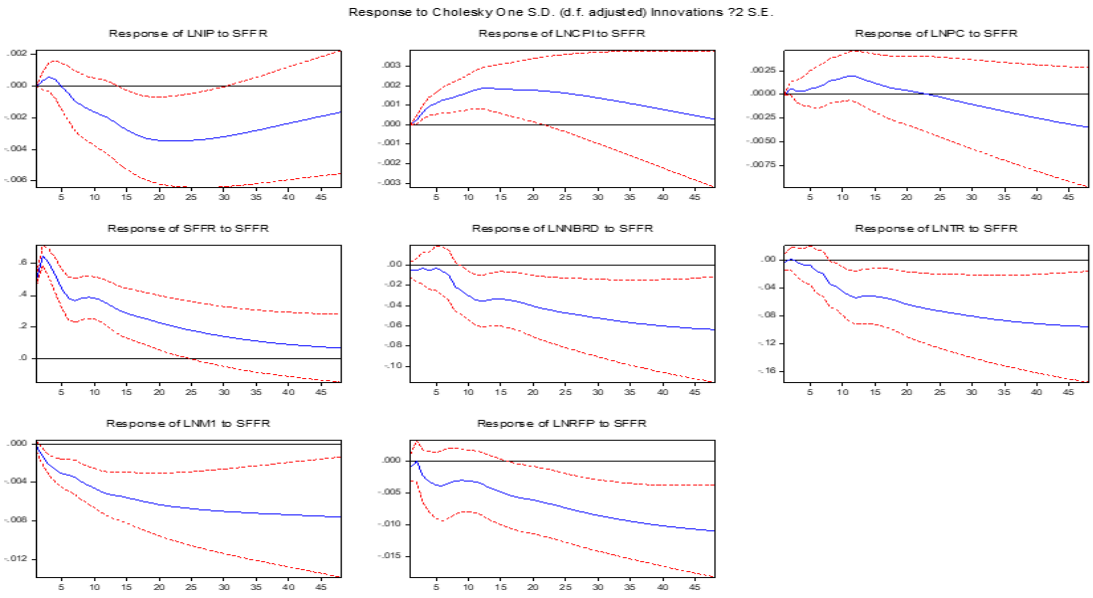

Figure 2 Real Farm Price Impulse Response Function with Shadow Federal Funds Rate 1969~2013

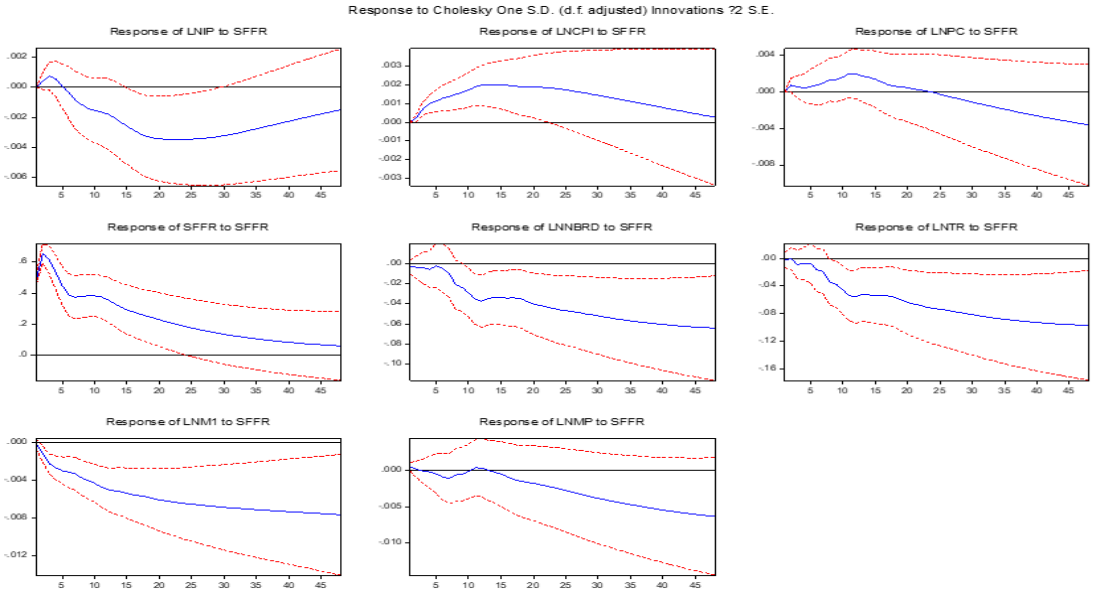

Figure 3 Nominal Metal Price Impulse Response Function with Shadow Federal Funds Rate 1969~2013

metal price shows delayed impact.

In order to see the impact of monetary policy shocks in some sub-period, historical decomposition was used. Figure 5 and Figure 6 are the result of Historical Decomposition of Real Farm Price and

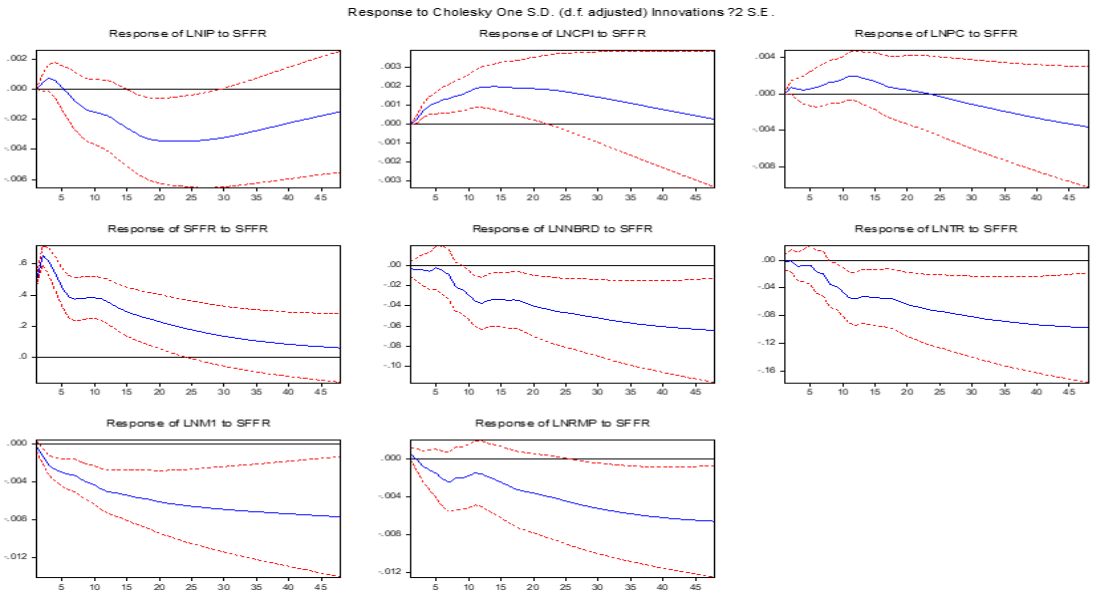

Figure 4 Real Metal Price Impulse Response Function with Shadow Federal Funds Rate 1969~2013

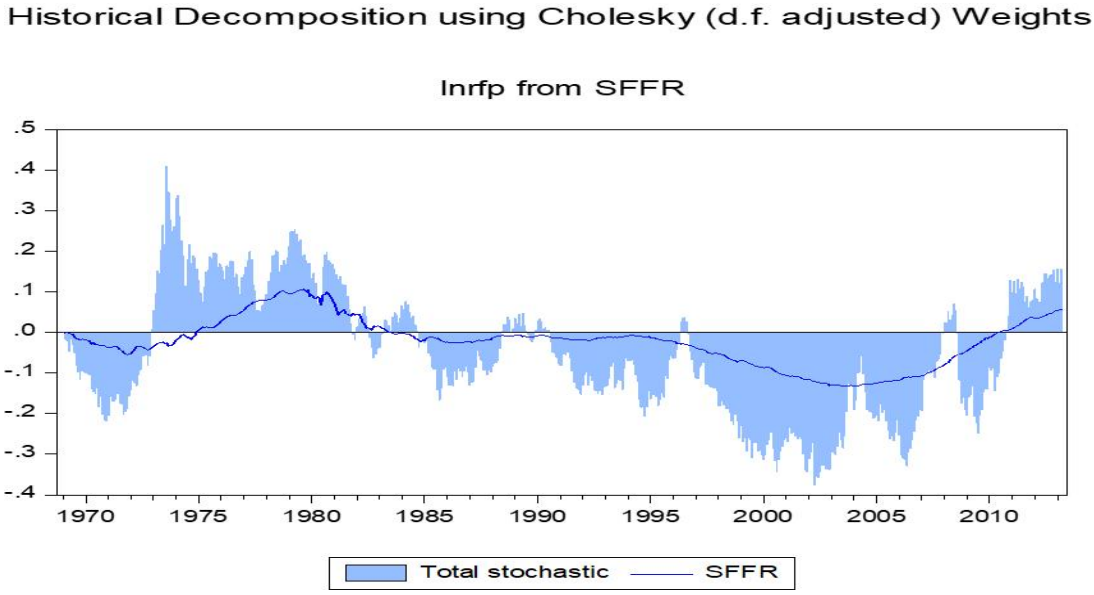

Figure 5 Historical Decomposition of Real Farm Price 1969~2013

Real Metal Price. The area filled with blue is forecast error of the Real Farm and Metal price, and the solid line displays forecast error of the Real Farm and Metal price due to monetary policy shock. Monetary shocks played a crucial role in a few sub-period. In the

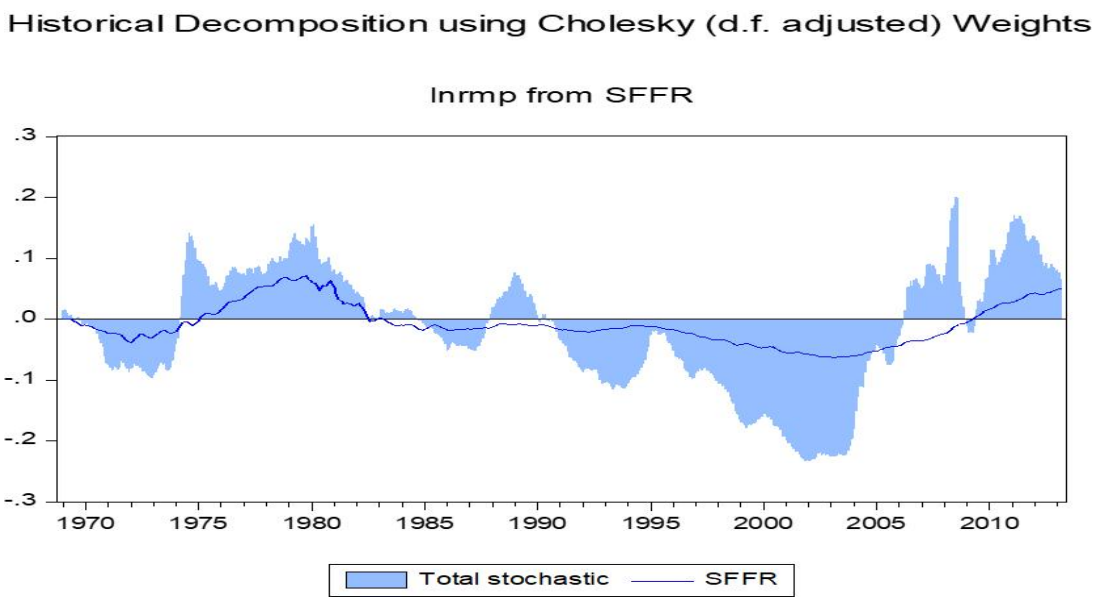

Figure 6 Historical Decomposition of Real Metal Price 1969~2013

early 1980's and 2000's, monetary shocks consist majority portion of the total forecast error.

In order to compare each period's monetary policy shocks' impact, variance decomposition was used. Table 1,2,3,4,5 and 6 shows the result of Variance decomposition which can examine the contribution of monetary policy shocks to the real farm and metal price fluctuation. Table 1 and 2 shows the variance decomposition result of Real Farm and Metal price in period 1969~2013. Table 3 and 4 shows the variance decomposition result of Real Farm Price and Metal in period 1969~1990. Table 5 and 6 shows the variance decomposition result of Real Farm and Metal price in period 1991~2013.

All tables reports the forecast error variance decomposition for 12, 24, 36 and 48-month horizons. The standard errors are also reported. In period 1969~2013, monetary policy shocks explain almost 30% fluctuations in the real farm and metal price. The effect is getting larger as time passes. Based on the comparison between table 3, 4, 5 and 6, the effect of monetary policy shocks consists more

portion in the former period, and real farm price is more sensitive to monetary policy shocks.

Horizon	SFFR	SE
12	2.654	2.722
24	10.69	6.22
36	21.79915	8.88914
48	31.00493	10.29

Table 1 Variance Decompostion of Real Farm Price 1969~2013

Horizon	SFFR	SE
12	2.920538	2.85238
24	9.990527	6.15815
36	19.51959	9.08367
48	28.11189	10.9816

Table 2 Variance Decompostion of Real Metal Price 1969~2013

Horizon	SFFR	SE
12	7.91	5.71
24	17.1	8.73
36	23.9	10.2
48	27	10.5

Table 3 Variance Decompostion of Real Farm Price 1969~1990

Horizon	SFFR	SE
12	4.82	4.42
24	18.8	8.02
36	29.5	10.1
48	35.6	11.2

Table 4 Variance Decompostion of Real Metal Price 1969~1990

Horizon	SFFR	SE
12	10.8	6.67
24	9.28	6.21
36	8.62	6.46
48	9.75	7.5

Table 5 Variance Decompostion of Real Farm Price 1991~2013

Horizon	SFFR	SE
12	3.59	4.19
24	9.08	8.24
36	6.91	7.68
48	5.29	7.51

Table 6 Variance Decompostion of Real Metal Price 1991~2013

3.2 Model with Shadow Federal Funds Rate

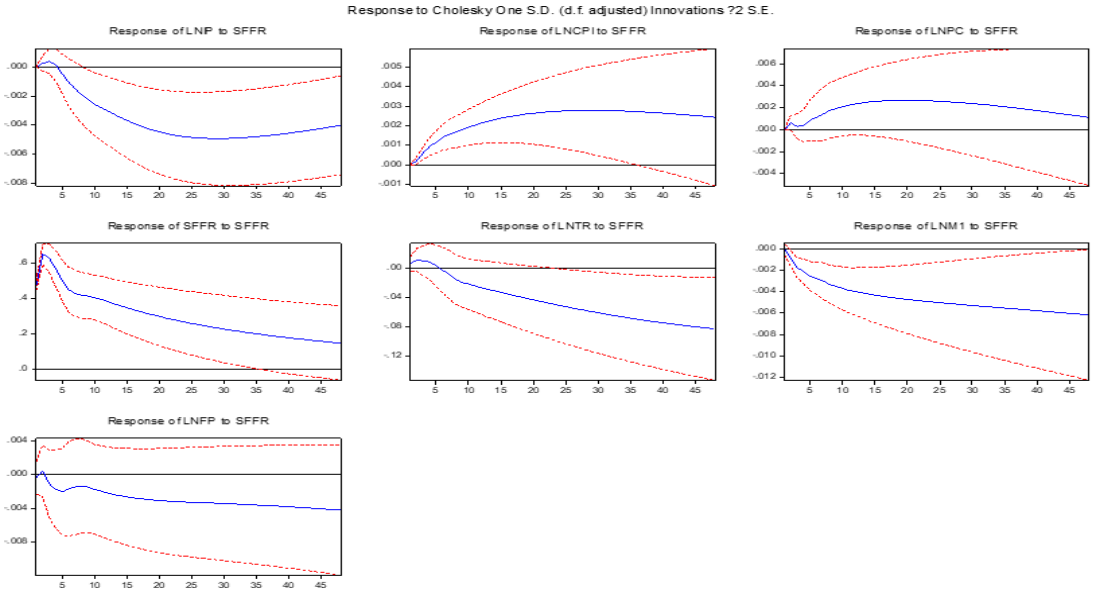

Figure 7 Nominal Farm Price Impulse Response Function with Shadow Federal Funds Rate 1969~2019

Figure 7 and 8, it shows the impulse response of period 1969~2019 to contractionary monetary policy shocks over a 48-month period under "Farm Price" and "Real Farm Price." Respectively, In response to contractionary monetary policy shocks, the nominal and real Farm Prices decrease persistently. It constantly decreases over time. However, it shows price puzzle.

Figure 9 and 10, it shows the impulse response function under "Metal Price" and "Real Metal Price." Respectively, In response to contractionary monetary policy shocks, the nominal and real metal prices does not affected much by monetary policy shocks, but it has

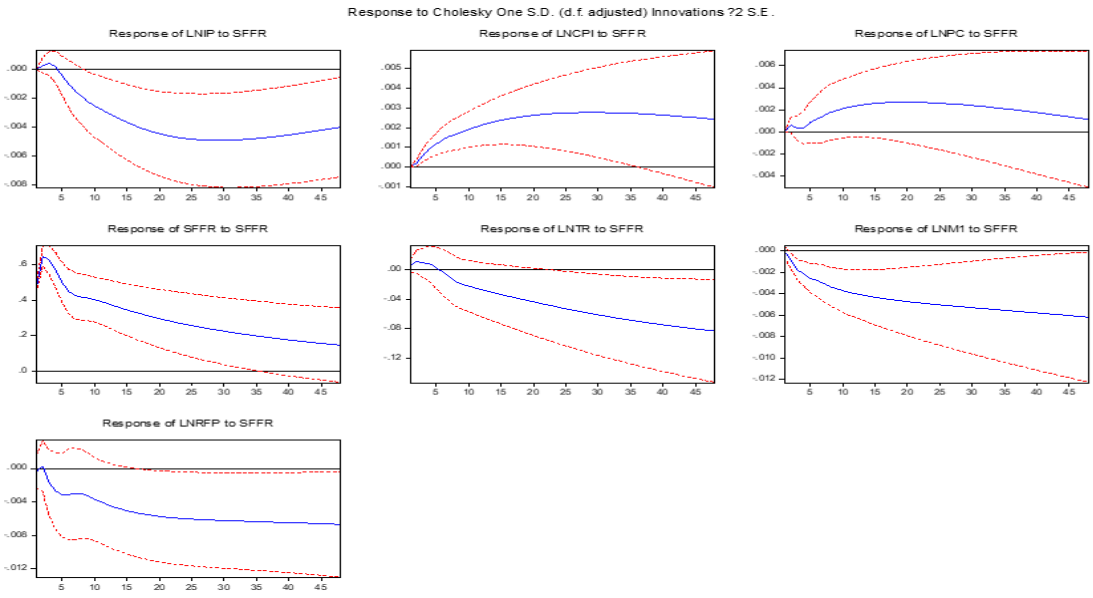

Figure 8 Real Farm Price Impulse Response Function with Shadow Federal Funds Rate 1969~2019

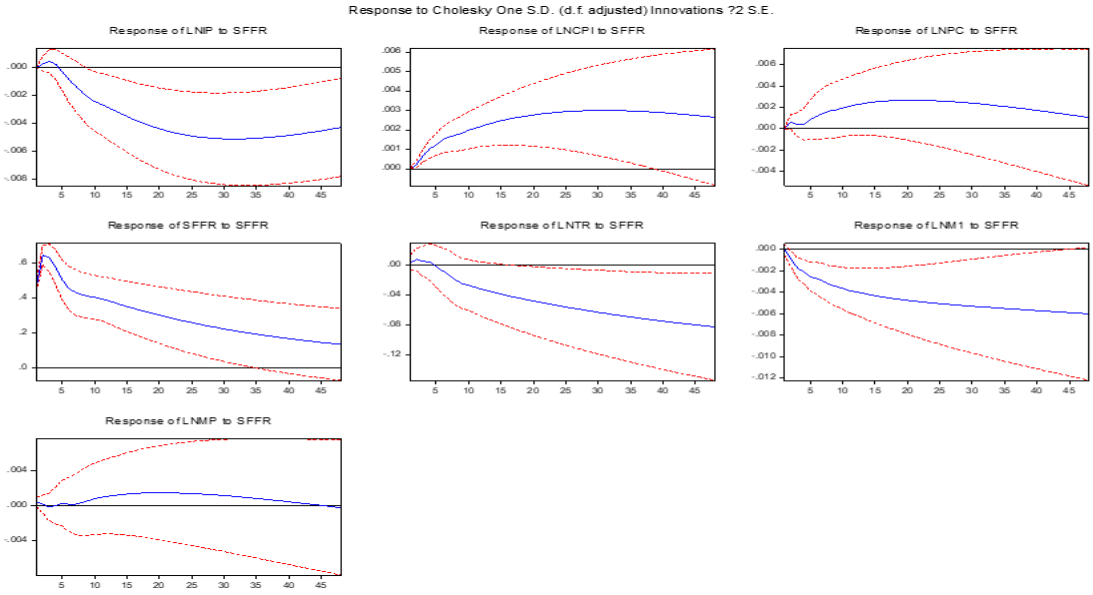

Figure 9 Nominal Metal Price Impulse Response Function with Shadow Federal Funds Rate 1969~2019

a tendency to decrease.

Figure 11 and Figure 12 are the result of Historical Decompostion of Real Farm Price and Real Metal Price in 1969~1990 period. Monetary shocks played a crucial role in a few sub-period. In

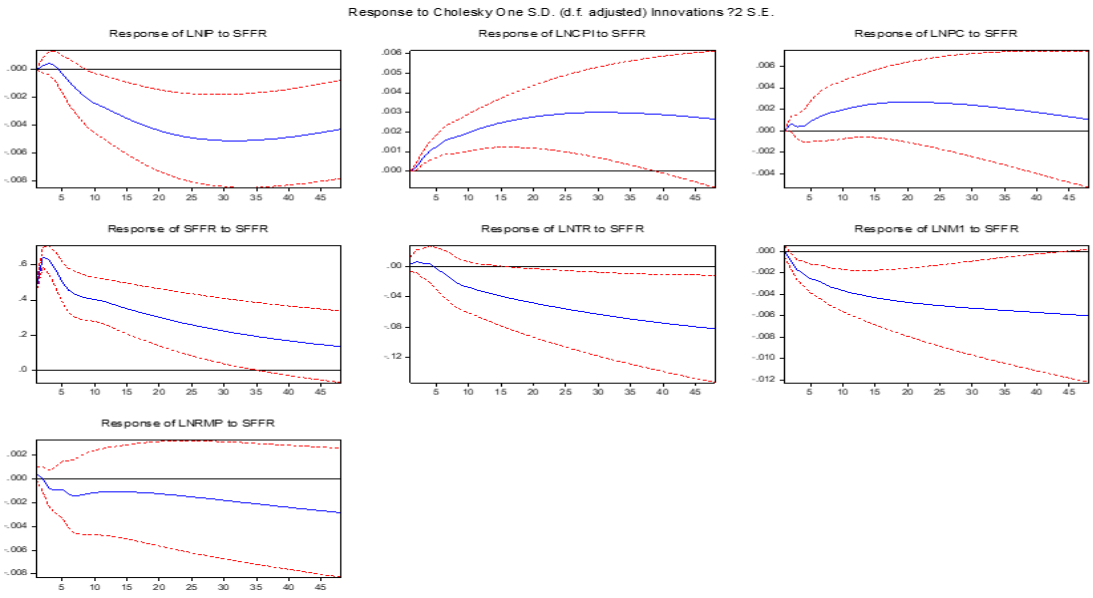

Figure 10 Real Metal Price Impulse Response Function with Shadow Federal Funds Rate 1969~2019

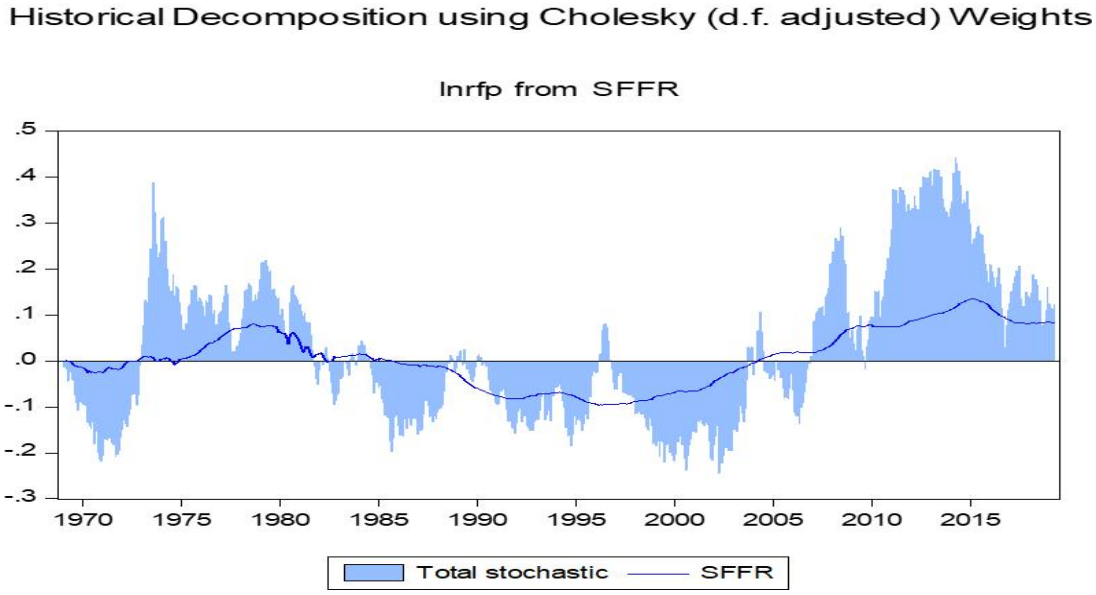

Figure 11 Historical Decomposition of Real Farm Price 1969~2019

the early 1980's and 2000's, monetary shocks consist majority portion of the total forecast error.

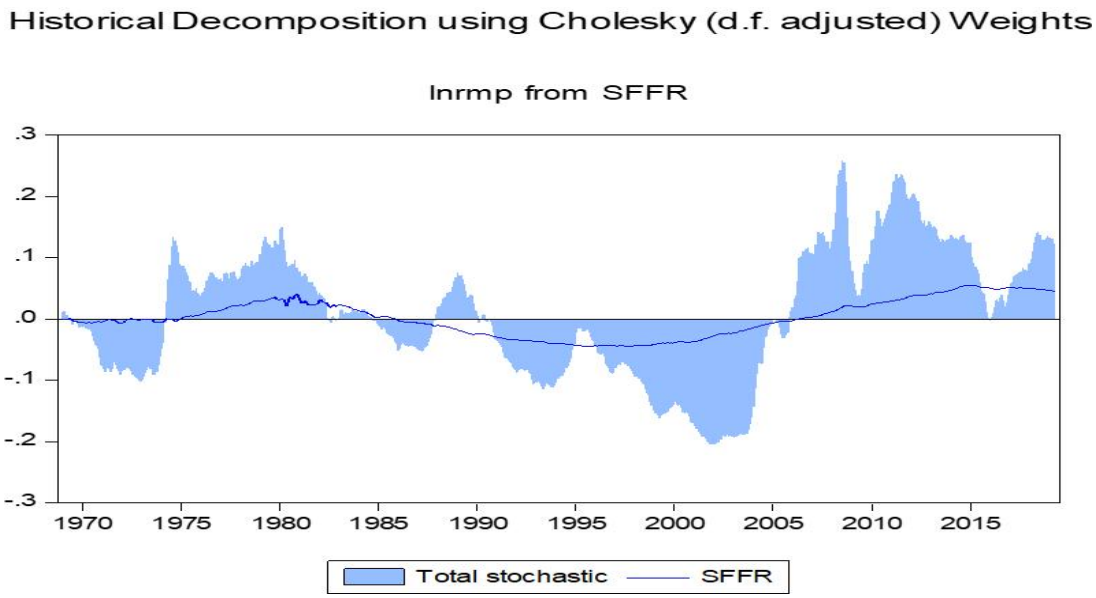

Figure 12 Historical Decomposition of Real Metal Price 1969~2019

Horizon	SFFR	SE
12	1.6742	2.2487
24	5.6211	4.6326
36	9.646	6.5387
48	13.176	7.8904

Table 7 Variance Decompostion of Real Farm Price 1969~2019

Horizon	SFFR	SE
12	0.4883	1.4496
24	0.6917	2.3848
36	1.3037	3.6526
48	2.3927	4.9838

Table 8 Variance Decompostion of Real Metal Price 1969~2019

Horizon	SFFR	SE
12	7.05	5.23
24	16.6	8.71
36	23.7	10.6
48	26.7	11.2

Table 9 Variance Decompostion of Real Farm Price 1969~1993

Horizon	SFFR	SE
12	2.34	3.3
24	12.7	7.4
36	24.8	10.8
48	33.1	12.6

Table 10 Variance Decompostion of Real Metal Price 1969~1993

Horizon	SFFR	SE
12	7.16	5.62
24	6.14	5.41
36	6.56	5.87
48	6.8	6.38

Table 11 Variance Decompostion of Real Farm Price 1994~2019

Horizon	SFFR	SE
12	1.21	2.78
24	8.33	7.71
36	9.86	8.77
48	9.95	9.23

Table 12 Variance Decompostion of Real Metal Price 1994~2019

Table 7, 8, 9, 10, 11 and 12 shows the result of Variance decomposition which can examine the contribution of monetary policy shocks to the real farm and metal price fluctuation. Table 7 and 8 shows the variance decomposition result of Real Farm and Metal price in period 1969~2019. Table 9 and 10 shows the variance decomposition result of Real Farm Price and Metal in period 1969~1993. Table 11 and 12 shows the variance decomposition result of Real Farm and Metal price in period 1994~2013.

All tables reports the forecast error variance decomposition for 12, 24, 36 and 48-month horizons. The standard errors are also reported. In period 1969~2019, monetary policy shocks explain average 10% of fluctuation in the real farm and metal price. The effect is getting larger as time passes. Based on the comparison between table 3, 4, 5 and 6, the effect of monetary policy shocks consists more portion in the former period, and real farm price is more sensitive to

monetary policy shocks.

3.3 Model with Shadow Policy Rate and Non Borrwed Reserves

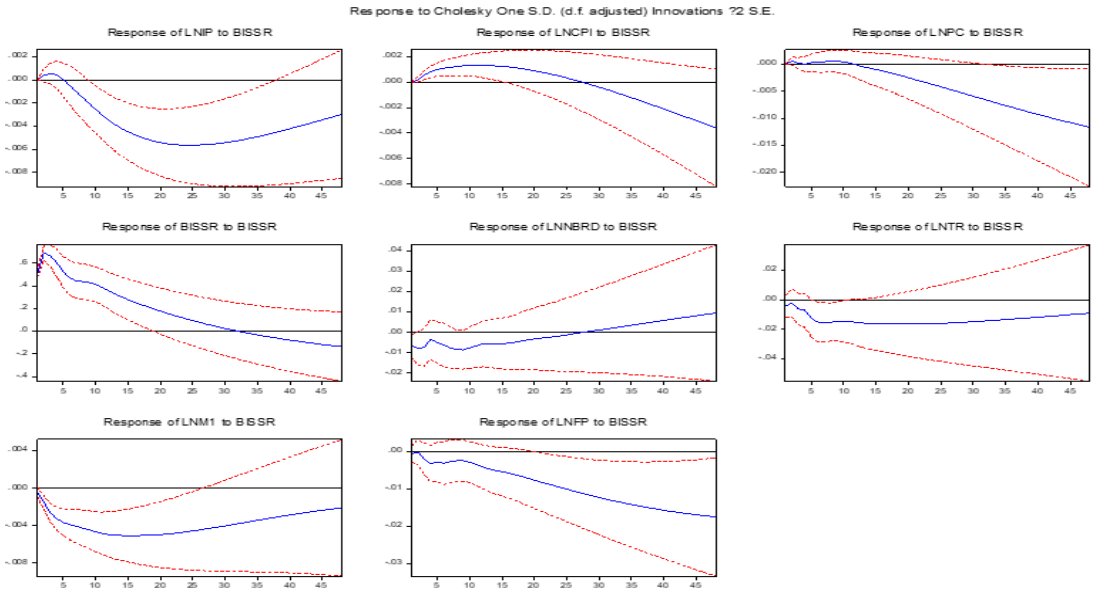

Figure 13 Nominal Farm Price Impulse Response Function with shadow policy rate 1969~2013

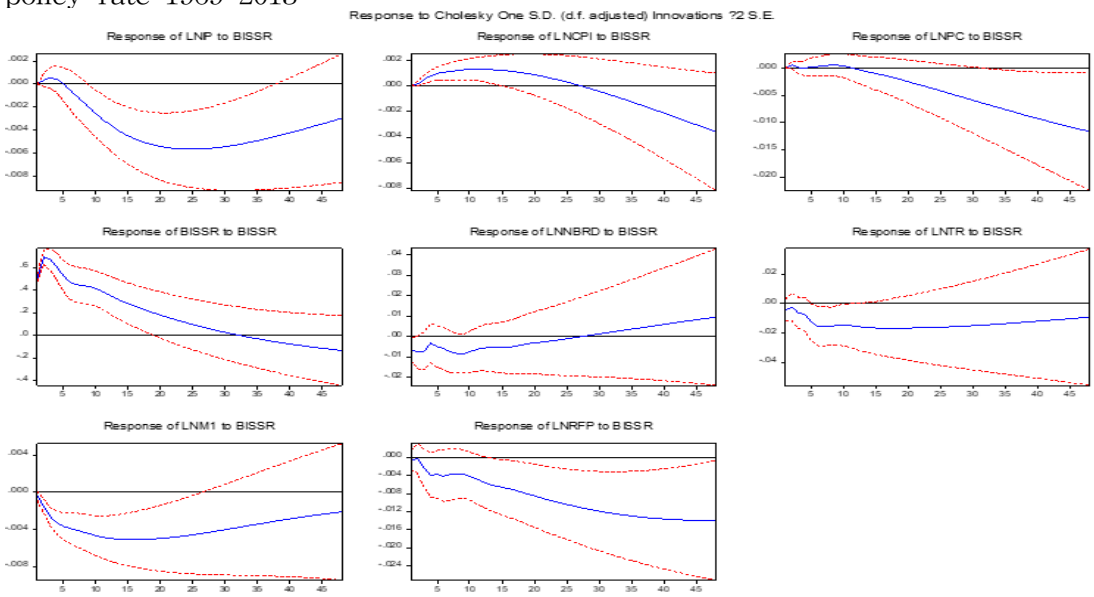

Figure 14 Real Farm Price Impulse Response Function with shadow policy rate 1969~2013

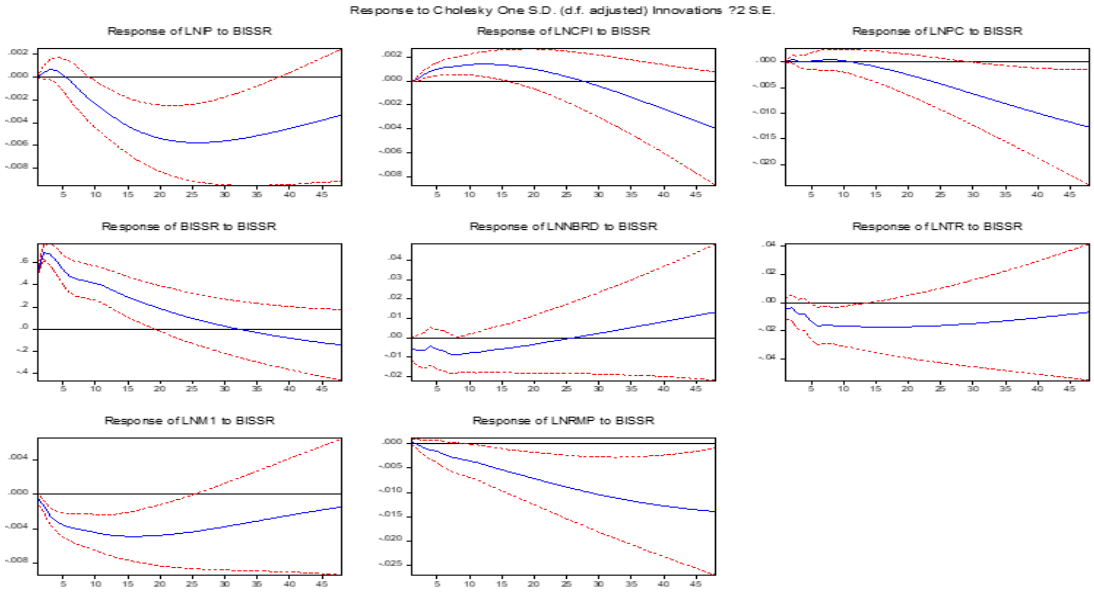

Figure 15 Real Metal Price Impulse Response Function with shadow policy rate 1969~2013

Figure 13 and 14, it shows the impulse response of period 1969~2013 to contractionary monetary policy shocks using Shadow policy rates over a 48-month period under “Farm Price” and “Real Farm Price.”

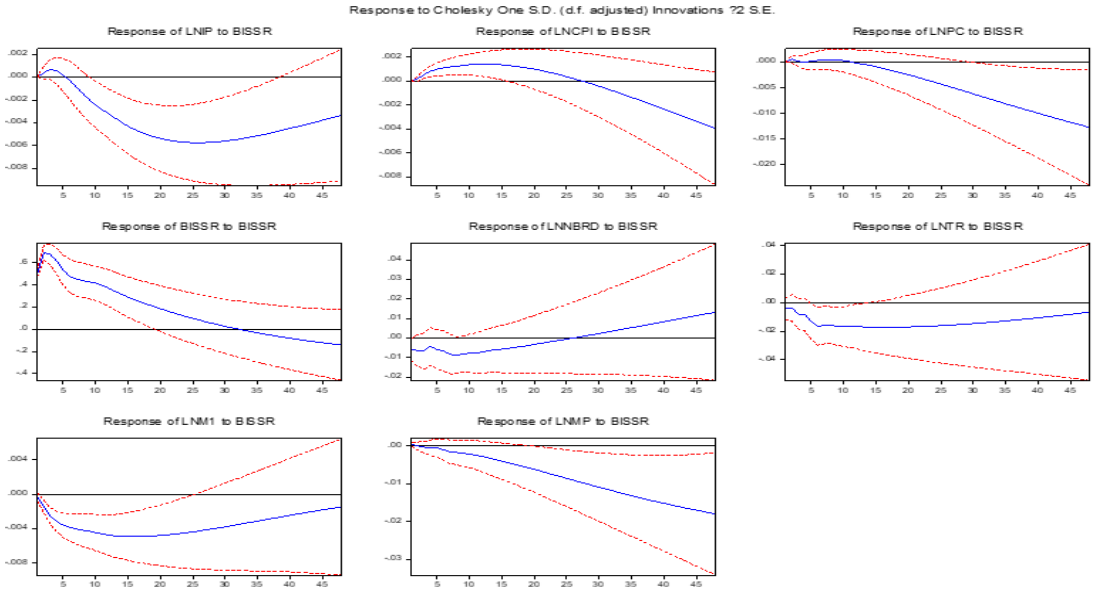

Figure 16 Nominal Metal Price Impulse Response Function with shadow policy rate 1969~2013

Respectively, In response to contractionary monetary policy shocks, the nominal and real Farm Prices decrease persistently. It constantly decreases over time.

Figure 15 and 16, it shows the impulse response function under “Metal Price” and “Real Metal Price.” Respectively, In response to contractionary monetary policy shocks, the nominal and real Metal Prices decrease persistently. It constantly decreases over time.

3.4 Model with Shadow Policy Rate

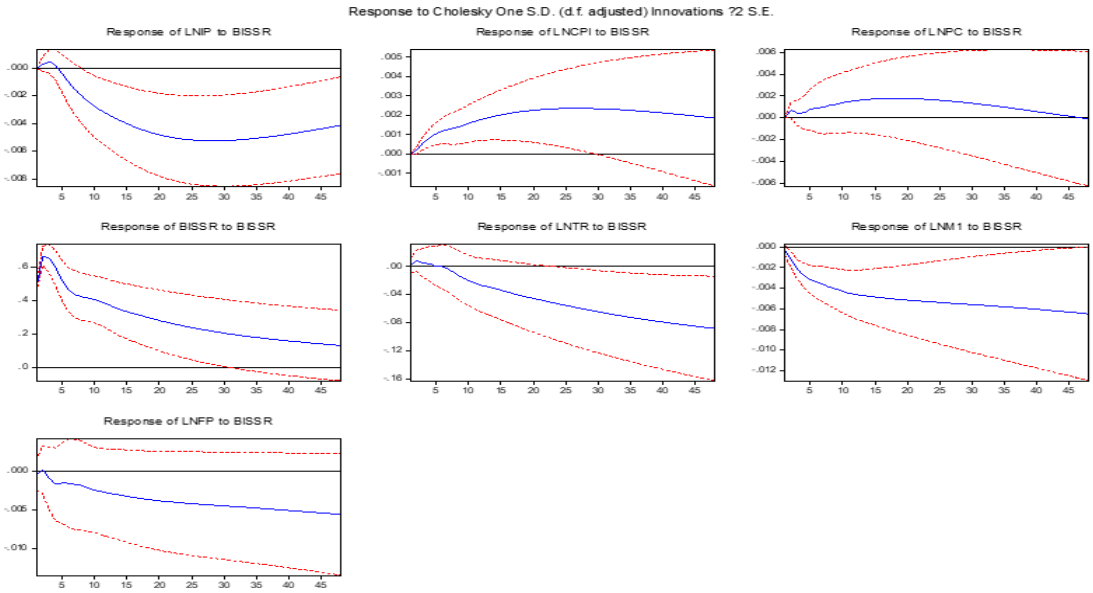

Figure 17 Nominal Farm Price Impulse Response Function with shadow policy rate 1969~2019

Figure 17 and 18, it shows the impulse response of period 1969~2019 to contractionary monetary policy shocks using Shadow policy rates over a 48-month period under “Farm Price” and “Real Farm Price.” Respectively, In response to contractionary monetary policy shocks, the nominal and real Farm Prices decrease persistently. It constantly decreases over time.

Figure 19 and 20, it shows the impulse response function under

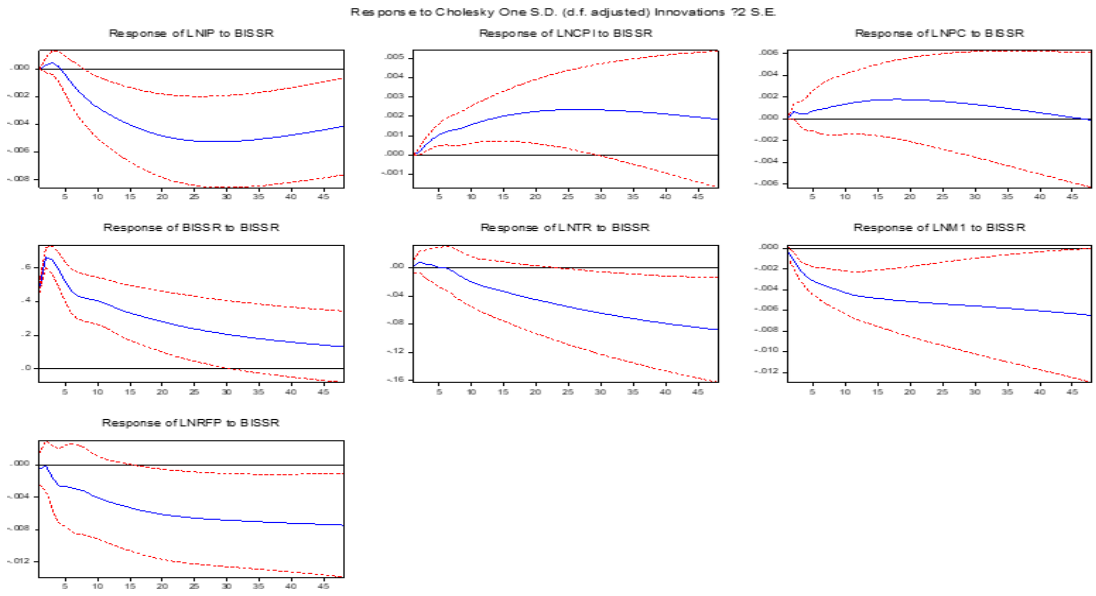

Figure 18 Real Farm Price Impulse Response Function with shadow policy rate 1969~2019

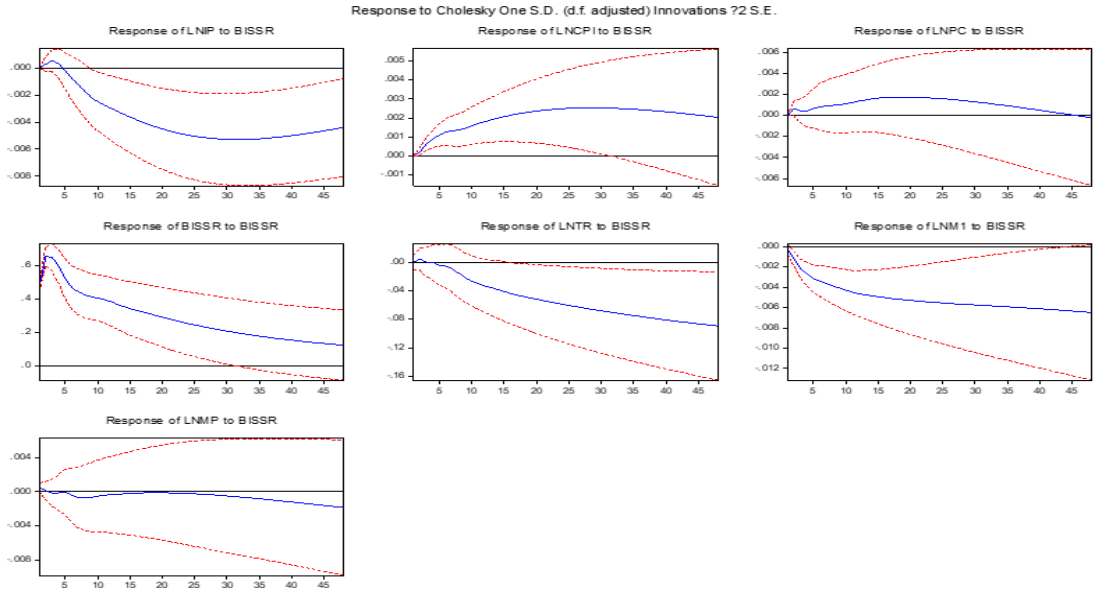

Figure 19 Nominal Metal Price Impulse Response Function with shadow policy rate 1969~2019

“Metal Price” and “Real Metal Price.” Respectively, In response to contractionary monetary policy shocks, the nominal and real Metal Prices does not affected much by monetary policy shocks, but it has a tendency to decrease.

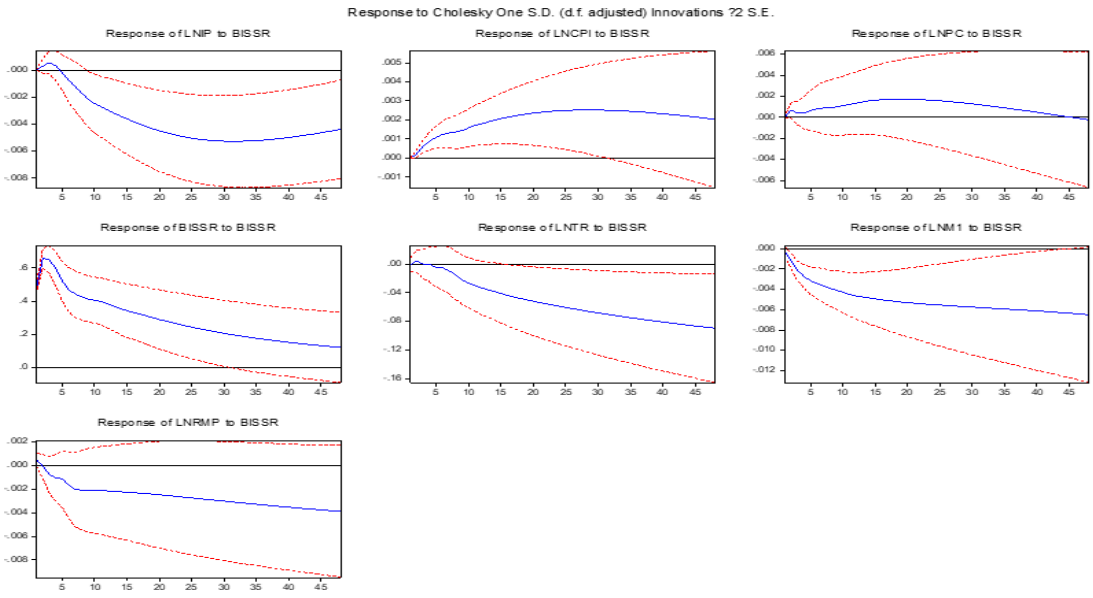

Figure 20 Real Metal Price Impulse Response Function with shadow policy rate 1969~2019

3.5 Relative Price Analysis

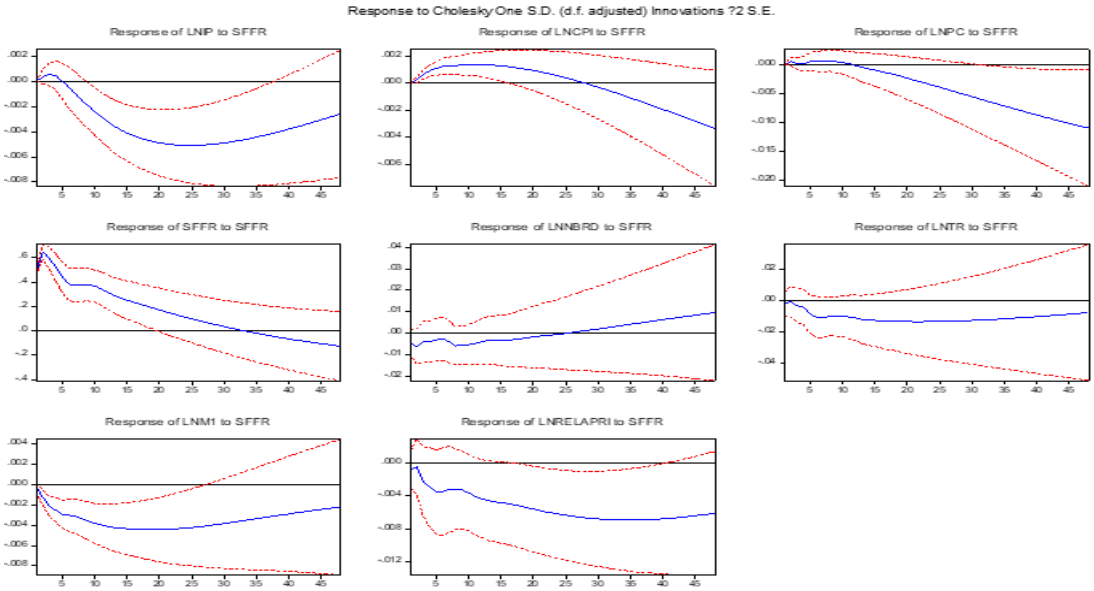

Figure 21 Relative Price Impulse Response Function with Shadow Federal Funds Rate 1969~2013

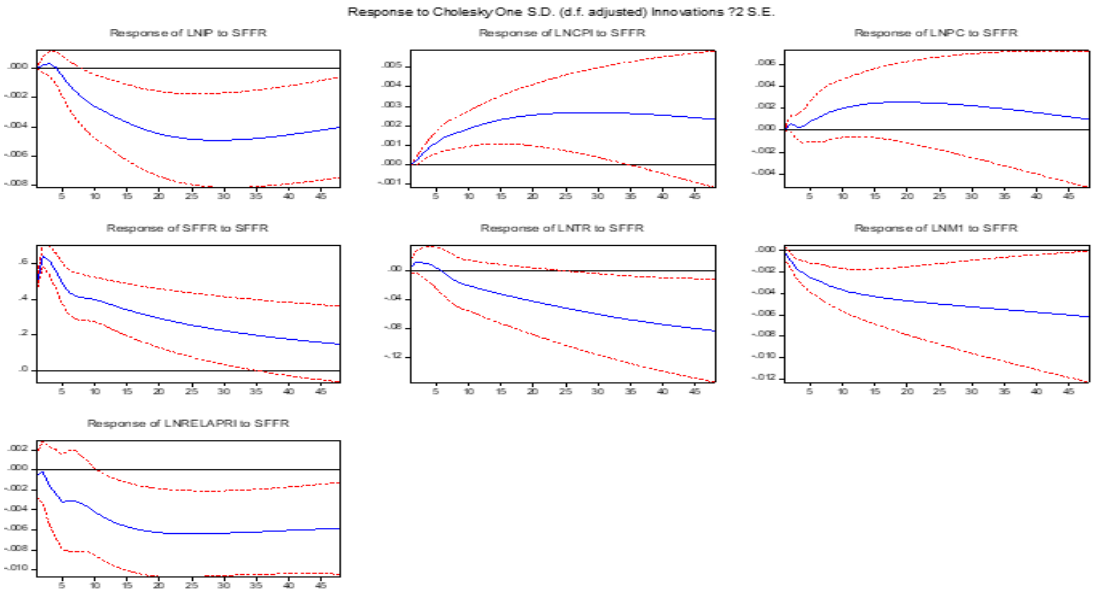

Figure 22 Relative Price Impulse Response Function with Shadow Federal Funds Rate 1969~2019

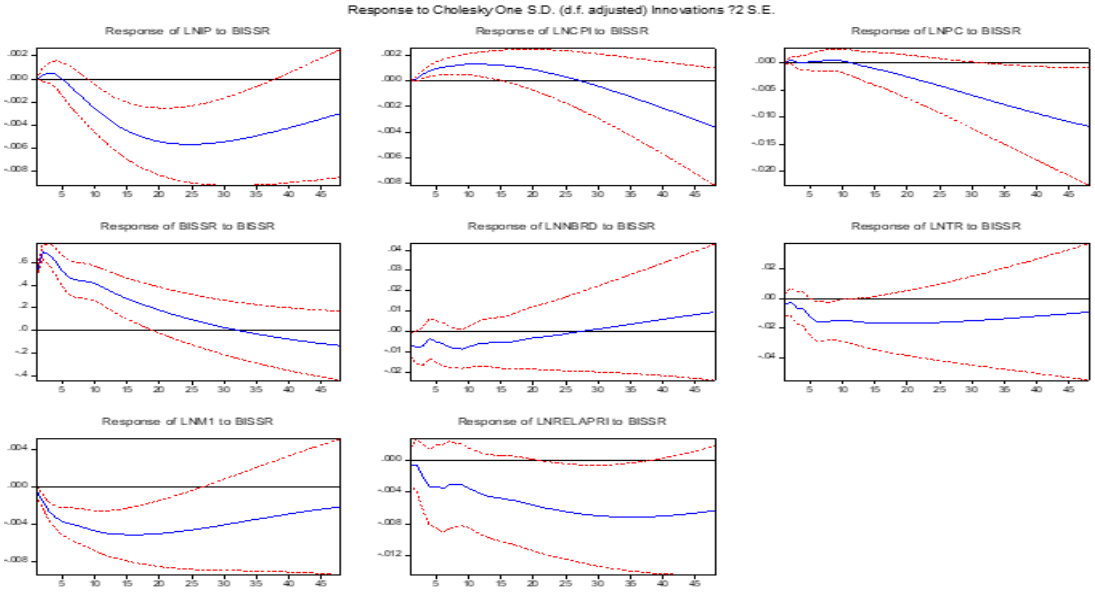

Figure 23 Relative Price Impulse Response Function with Shadow policy Rates 1969~2013

Figure 21, 22 23 and 24 shows impulse response function of relative price(Real farm price/Real non-farm price). All four figures shows decrease of relative price which means farm sector commodity is more elastic to monetary policy shocks compare to non-farm

commodity sector.

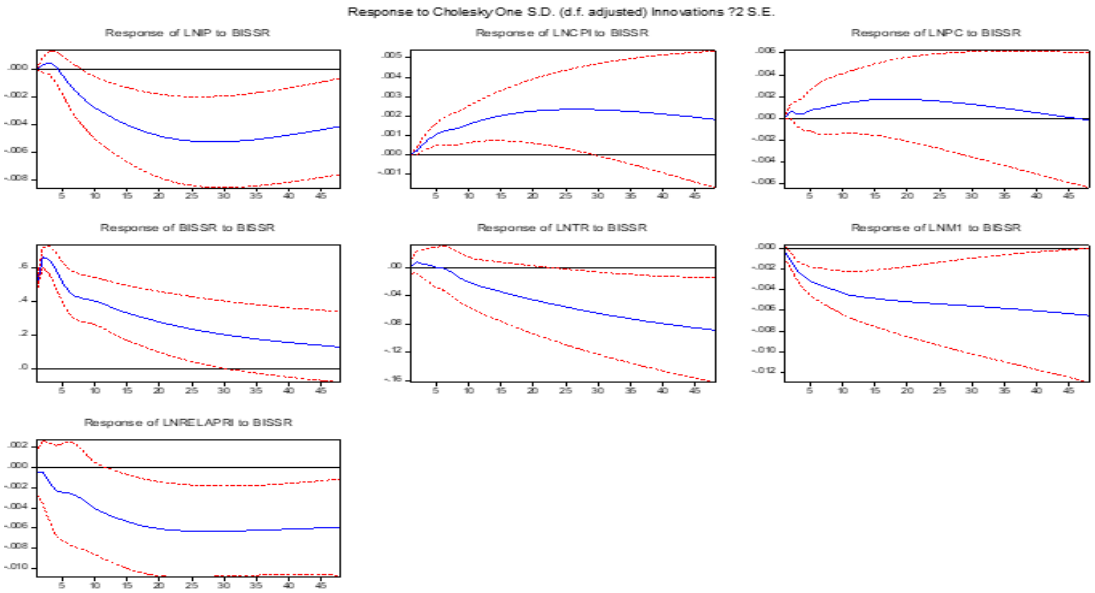

Figure 24 Relative Price Impulse Response Function with Shadow policy Rates 1969~2019

Chapter 4: Conclusion

This paper examines the effects of monetary policy shocks on the real farm and metal price using recursive VAR models. In this paper, followings are improved compare to past studies. First, past studies could not analyze ZLB(Zero Lower Bound) period, but in this paper the introduction of the shadow rates made including ZLB period possible. Second, analysis of each variables which are real farm price and real metal price could infer what is the difference between farm commodity market and metal commodity market on monetary policy shocks. Third, based on the difference between markets, this paper examines the impact on relative price. Fourth, by doing historical decomposition and variance decomposition, this paper examines the role of monetary policy shocks in each historical episode.

The result suggests contractionary monetary policy shocks significantly decreases the real farm and metal commodity price with persistence, and the effects are statistically significant. Comparing real farm price and real metal price, the effect of monetary policy shocks on real farm price is stronger than the effect on real metal price. The analysis with both shadow federal funds rate and shadow policy rate show similar result.

In the relative price analysis, the impulse response function shows that negative impact has generated by monetary tightening. Since farm sector commodity price is more elastic than non farm sector commodity price, the degree of impact is powerful than non farm sector commodity price. This is because the supply elasticity of farm sector commodity is lower than non farm sector commodity supply elasticity. The reason why there is the difference in supply elasticity is farmer can not control depends on market condition.

They only set their goal production at the beginning of production process.

Based on the results of historical decomposition and variance decomposition, monetary policy shocks played a crucial role in a specific sub-period such as early 1980's, early 2000's and middle of 2010. In order to compare which period is more affected by monetary policy shocks, variance decomposition is conducted to former period and latter period. Most of results shows that the effect of monetary policy shocks consists more portion in the former period. The overall contribution of monetary policy shocks tends to be larger than some finding in past studies.

There are lots of tries to find good identifier which can examine Zero Lower Bound period such as narrative method by Romer and Romer. With good measure, we could analyze the effect of monetary policy shocks more precisely. Farm and metal commodity market consist crucial part of our economy, we need to understand the characteristic of market more precisely, so we can establish policy which does not harm market in unexpected way.

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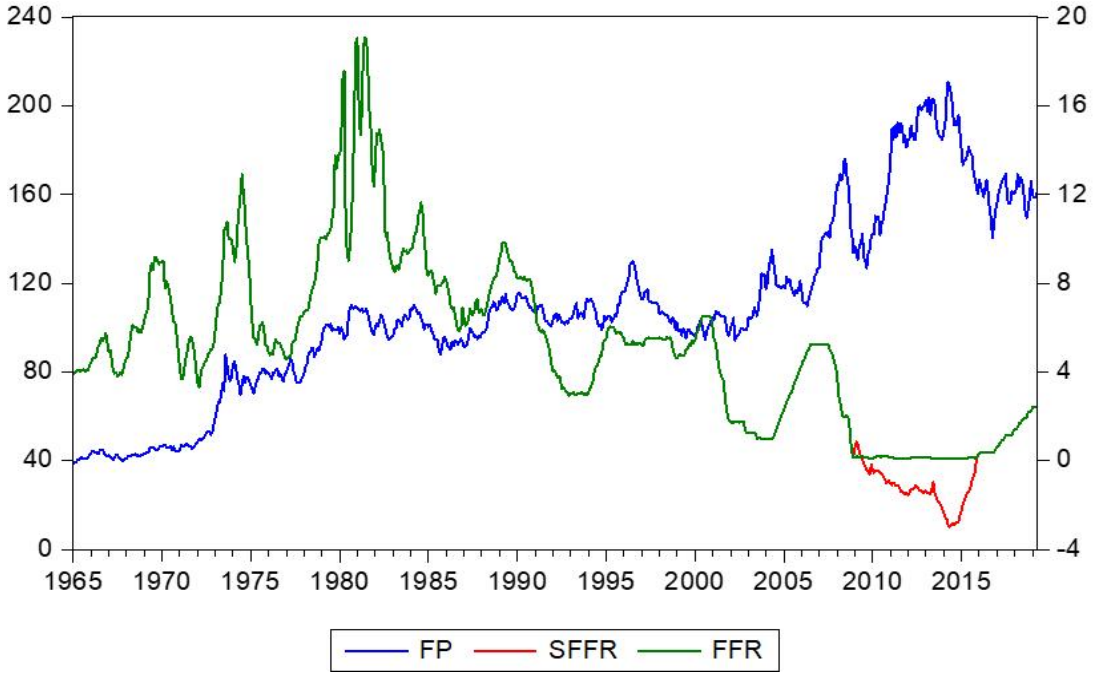
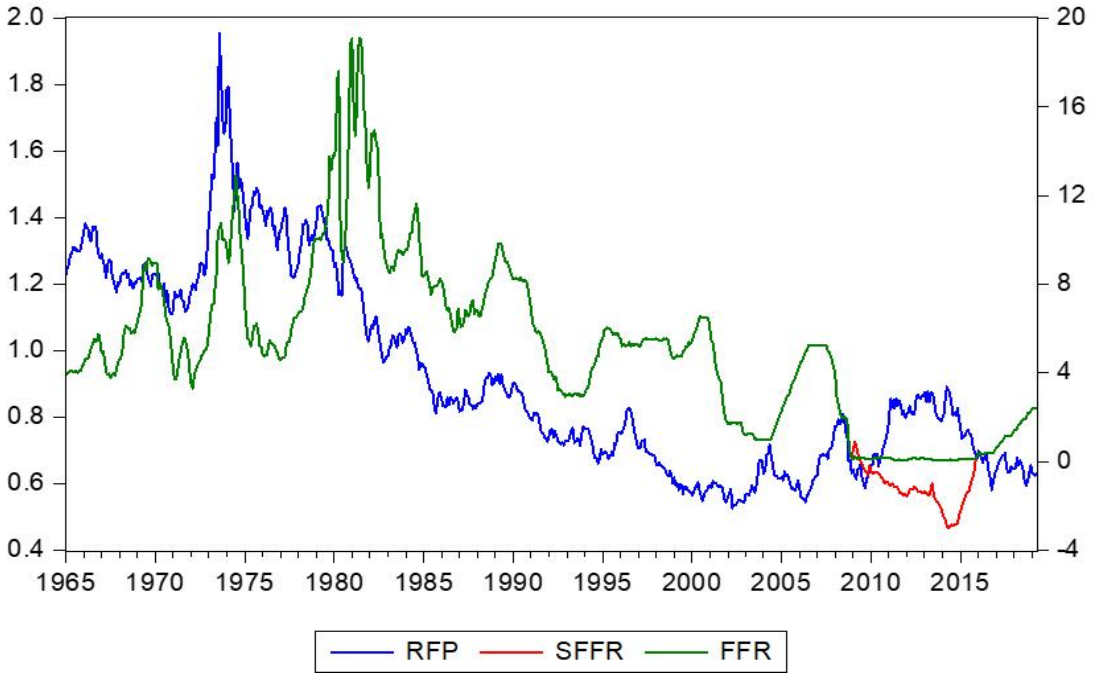
Appendix

Variable	Description	Sources and Notes
IP	Industrial Production Index	Federal Reserve Bank of St.Louis Macro Database
CPI	Consumer Price Index	Federal Reserve Bank of St.Louis Macro Database
PC	Producer Price Index by commodity	Federal Reserve Bank of St.Louis Macro Database
SFFR	Shadow Federal Funds Rate	Federal Funds Rate + Shadow Federal Funds Rate
BISSR	Shadow Policy Rate	Federal Funds Rate + Shadow policy Rate
NBRD	Non borrowed Reserves plus extended credit	Federal Reserve Bank of St.Louis Macro Database
TR	Total Reserves of depository institution	Federal Reserve Bank of St.Louis Macro Database
M1	Monetary aggregate	Federal Reserve Bank of St.Louis Macro Database
FP	Nominal Farm Price	Federal Reserve Bank of St.Louis Macro Database
RFP	Real Farm Price	FP/CPI
MP	Nominal Metal Price	Federal Reserve Bank of St.Louis Macro Database
RMP	Real Metal Price	MP/CPI
RelativePrice	Relative Price of Farm and non-Farm products	RFP/Non-farm Price

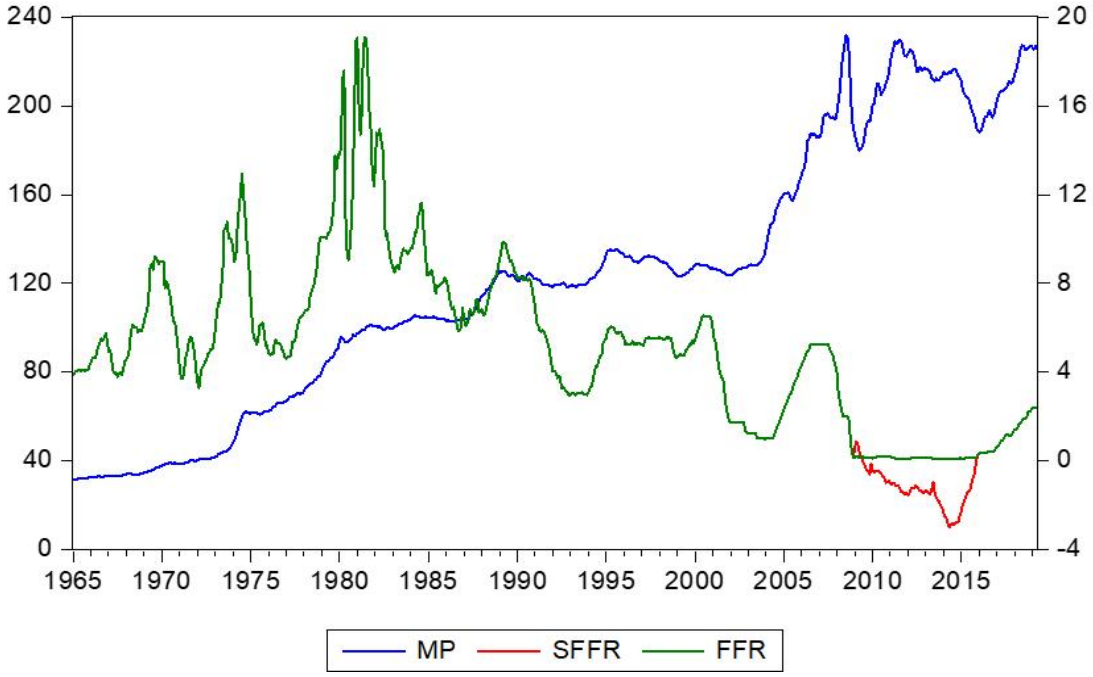
<Appendix table 1> Data Sources



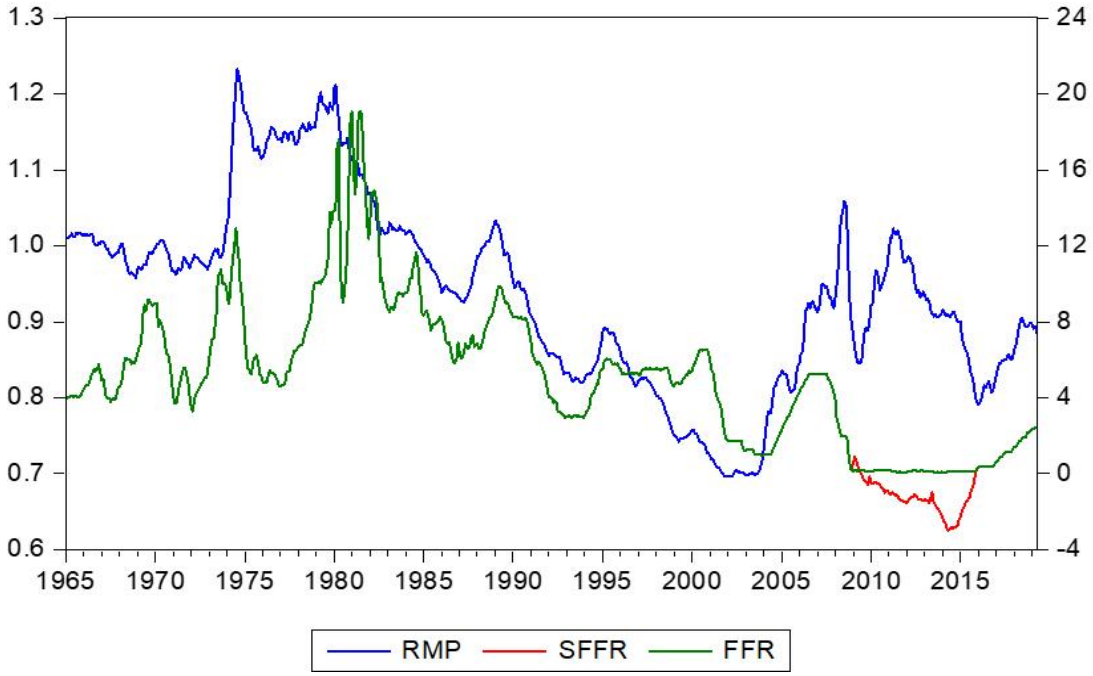
<Appendix figure 1> Nominal Farm Price & Shadow Federal Funds Rate



<Appendix figure 2> Real Farm Price & Shadow Federal Funds Rate



<Appendix figure 3> Nominal Metal Price & Shadow Federal Funds Rate



<Appendix figure 4> Real Metal Price & Shadow Federal Funds Rate

Correlation	SFFR
SFFR	1.0000
FP	-0.5411
MP	-0.5970
RFP	0.5075
RMP	0.5181

<Appendix Table 2> Correlation between variables

국문초록

본 연구는 실질 농산 미가공품과 실질 광산 미가공품에 통화 충격이 어떻게 영향을 주는지에 대해 VAR 기법을 사용하여 알아보고자 한다. 제로금리제약 하에서 통화충격의 효과를 분석하기 위해서 잠재금리를 사용하였다. 그 결과 긴축 통화충격이 실질 농산품과 실질 광산품 가격을 감소시켰고 장기적인 영향을 주는 것을 보였다. 또한 특정한 시기에서 농산품과 광산품의 가격이 통화충격에 큰 영향을 받는 것을 보였고, 특히 통화충격이 후기 보다 전기에서 큰 역할을 한 것을 관찰할 수 있었다. 마지막으로 농산품 가격이 통화충격에 대해서 다른 산업군 보다 민감함을 관찰할 수 있었다.

주요어 : VAR, 농산품 가격, 광산품 가격, 통화충격, 잠재금리
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